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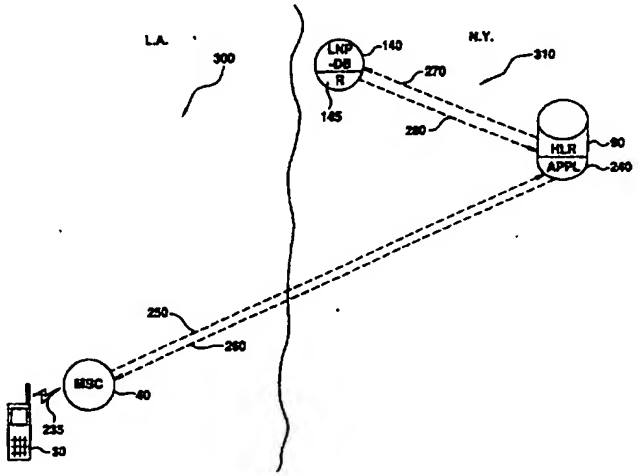

(57) Abstract

A roaming mobile station (30) travels into a new mobile switching center (MSC) (40) coverage area and performs a location update (250) with a home location register (HLR) (90) associated with the mobile station. An application module (240) within the HLR determines that the mobile station is located outside of the home Public Land Mobile Network (PLMN) (310) and updates (270) a serving number portability database (NP-DB) (140) to reflect that the mobile station has been ported to the new PLMN. All incoming calls cause a querying (160) of the NP-DB to identify the new PLMN for the mobile station. In accordance with the retrieved network address (165), the calls are accordingly routed (270) to the new PLMN directly without establishing a call connection to the home PLMN. Whenever the mobile station travels back into the home PLMN, the HLR again updates (320) the NP-DB to remove the previously stored data indicating that the mobile station has been ported.

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USING NUMBER PORTABILITY DATABASE TO SOLVE CALL TROMBONING

CROSS REFERENCE TO RELATED APPLICATIONS

This application is related to U.S. Application for Patent Serial No. 08/710,346 filed September 16, 1996, entitled "Optimized Routing Of Mobile Calls Within A Telecommunications Network" (Docket No. 27943/96), U.S. Application for Patent Serial No. 08/710,349 filed September 16, 1996, entitled "Optimized Routing Of Calls To Roaming Subscribers Within A Telecommunications Network" (Docket No. 27943/100), and to U.S. Application for Patent Serial No. 08/710,347 filed September 16, 1996, entitled "Optimized Routing Of Terminating Calls Within A Mobile Telecommunications Network" (Docket No. 27943/98), all filed concurrently herewith, and is also related to U.S. Application for Patent Serial No. 08/656,723, filed June 3, 1996, entitled "Routing An Incoming Call To A Ported Mobile Station Within A Telecommunications Network", all incorporated by reference herein.

BACKGROUND OF THE INVENTION

Technical Field of the Invention

The present invention relates to a telecommunications network and, in particular, to the optimized routing of terminating calls towards a mobile station.

Description of Related Art

With the advent and development of mobile telecommunications systems, telecommunications users are no longer physically bound to wireline terminals or fixed locations for telecommunications network communications. Using the added capabilities of roaming and interoffice handoffs, mobile subscribers may travel between multiple Public Land Mobile Networks (PLMNs) utilizing the same

telephone number and the same mobile station to originate outgoing calls and to receive incoming calls. Thus, a mobile subscriber may access telecommunications service from multiple locations utilizing multiple service providers with any incurred fees being charged to a single subscription. Furthermore, calling parties do not necessarily have to know where the mobile subscriber is physically located in order to establish a call connection. Data signals between visitor location registers (VLRs) and a home location register (HLR) automatically update and store subscriber information, in particular subscriber location information, enabling the network to reroute incoming calls to the appropriate mobile switching center (MSC) serving the roaming mobile subscriber. Furthermore, regardless of which MSC is currently serving the mobile station, the VLR associated with the serving MSC communicates with the HLR assigned to the mobile station to retrieve the requisite subscriber data, including subscriber feature data and billing data, to provide uniform mobile service to the mobile station.

Conventionally, if a mobile station associated with a New York (N.Y.) mobile telecommunications network is traveling in Los Angeles (L.A.), an incoming call towards the roaming mobile station is first routed to the gateway mobile switching center (GMSC) serving the N.Y. public land mobile network (PLMN) associated with the mobile station. Thereinafter, the N.Y. GMSC performs an interrogation with the home location register (HLR) associated with the mobile station to determine the current location of the roaming mobile station. Upon determining the identity of the L.A. mobile switching center (MSC) currently serving the N.Y. mobile station, the received incoming call is rerouted by the N.Y. GMSC to the serving L.A. MSC to enable a speech connection between the calling party terminal and the roaming mobile station.

Accordingly, if the calling party is originating a call setup signal from L.A., a first trunk call connection between the L.A. telecommunications network and the GMSC serving the home PLMN in N.Y. is initially established and then a second trunk call connection between the GMSC back to the L.A. MSC currently serving the mobile station is established. As a result, a "tromboning" of trunk call connections through N.Y. is performed in order to establish a call connection between two telecommunications subscribers both located in L.A.

If the mobile station is permanently ported or relocated from N.Y. PLMN to L.A. PLMN, the use of the concept of number portability allows the porting mobile station to maintain the same directory number and still enable incoming calls to be rerouted to the L.A. PLMN without being routed all the way over to the N.Y. PLMN. Accordingly, number portability allows a mobile subscriber to port from an existing service area to a new PLMN area or HLR area without changing the mobile subscriber's assigned Mobile Station Integrated Services Digital Network (MSISDN) number or directory number. A number portability database storing the network address of the new telecommunications node serving the ported mobile station is used to route incoming calls to the appropriate telecommunications node.

However, even with the number portability centralized database, call "tromboning" is still a problem for a mobile station roaming within a visited PLMN. Such "tromboning" trunk call connections are disadvantageous for a number of reasons. Unnecessary trunk connections have to be established and maintained in order to enable two subscribers who are locally located to communicate with each other and result in unnecessary seizure of valuable network resources. Additionally, even though the called party mobile station is receiving an incoming call from a calling party terminal located within the same local access transport area (LATA), such as L.A., the

called party mobile station has to incur long distance charges for forwarding the call connection from his or her home PLMN to the visited PLMN. Furthermore, the calling party also has to incur long distance charges to N.Y. for calling another mobile station located within the same PLMN.

Accordingly, there is a need for a mechanism to enable the serving mobile telecommunications network to perform optimal routing of a mobile call towards a roaming mobile station.

SUMMARY OF THE INVENTION

The present invention discloses a method and system for optimally routing a mobile call to a roaming mobile station within a telecommunications network.

A home location register (HLR) associated with the roaming mobile station receives a location update signal from a particular mobile switching center (MSC) currently serving the mobile station. The HLR then determines whether the serving MSC is located within the home public land mobile network (PLMN) associated with the mobile station. In response to a determination that the serving MSC is located outside of the home PLMN associated with the mobile station, the HLR communicates with a number portability database (NP-DB) serving the home PLMN to store data indicating that the mobile station has been ported to the serving MSC. The data includes a network address representing the serving MSC. Thereinafter, by querying the NP-DB, an originating telecommunications node serving a calling party terminal may determine the current location of the mobile station and directly route a call connection to the serving MSC rather than through the home PLMN.

When the mobile station travels back into the home PLMN, an MSC associated with the home PLMN performs another location update with the HLR. After determining that the new MSC is associated with the home PLMN, the HLR

communicates with the NP-DB to remove the previously stored data indicating that the mobile station has been ported.

As a result, virtual or temporarily porting is performed whenever a mobile station travels outside of his home PLMN.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of the method and apparatus of the present invention may be had by reference to the following detailed description when taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a block diagram of a telecommunications network illustrating the network interconnection of multiple Public Land Mobile Network (PLMNs) to a Public Switched Telephone Network (PLMN);

FIGURE 2 is a block diagram of a telecommunications network illustrating the routing of a terminating call to a ported mobile station;

FIGURE 3 is a block diagram of a telecommunications network illustrating the tromboning of trunk connections to establish a call connection between a calling party terminal and a roaming called party mobile station;

FIGURE 4 is a block diagram illustrating a home location register (HLR) associated with the roaming mobile station updating a number portability - database (NP-DB); and

FIGURE 5 is a block diagram of a telecommunications network illustrating an originating telecommunications node optimally routing an outgoing call connection to a roaming mobile station.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram illustrating the network interconnection of multiple Public Land Mobile Networks (PLMNs) 10a-10b to a Public Switched Telephone Network (PSTN) 20. A mobile station 30 (also known as a mobile

terminal or equipment) is associated with one of the PLMNs 10 as the home PLMN 10a. Within each PLMN 10, e.g., PLMN 10a, there are a number of different mobile switching centers (MSCs, only one shown in FIG. 1 for each PLMN 10) 40 servicing the geographic area covered by the network. A mobile station 30 communicates with a radio base station (not shown) connected to one of the MSCs 40 via over-the-air communications links 50. The mobile station 30 served by one PLMN 10a then communicates with other wireline and wireless terminals by means of connections to the PSTN 20. The access tandem (AT) 60 within the PSTN 20 routes the mobile calls generated from the one PLMN 10a to a wireline terminal 15 serviced by one of its local exchanges (LEs, only one shown in FIG. 1) 70 within the PSTN 20, or to another PLMN 10b by a way of its gateway mobile switching center (GMSC) 80b.

For an incoming call intended for the mobile station 30, the incoming call is first routed to the GMSC 80a serving the home PLMN 10a. The GMSC 80a analyzes the directory number, such as an Mobile Subscriber Integrated Service Digital Network (MSISDN) number, included in the incoming call and determines the home location register (HLR) 90a associated with the destination called party mobile station 30. The GMSC 80a then sends a signal 100 requesting routing information to the determined home location register (HLR) 90a for that mobile station 30. The HLR 90a (which stores subscriber information and keeps track of the current location of the mobile station 30) then requests a roaming number from a mobile switching center (MSC) 40a currently serving the mobile station 30 via a signal 110. As a result, the serving MSC 40a returns a roaming number to the HLR 90a. The HLR 90a then returns the roaming number back to the GMSC 80a. The returned roaming number represents the MSC 40a currently serving the mobile station 30. Upon receipt of such roaming number, the GMSC 80a transmits the incoming call to the serving MSC 40a. The serving MSC 40a then

establishes a speech connection with the mobile station 30 located within its MSC serving area.

With the continuing development in the mobile telecommunications technology and the increasing number of mobile subscribers, an innovative concept called "number portability" is becoming popular. The number portability concept allows a mobile subscriber to relocate or "port" from an existing service area to a new PLMN area or HLR area (as illustrated by an arrow 35) without changing the mobile subscriber's assigned Mobile Station Integrated Services Digital Network (MSISDN) number or directory number. By not changing the assigned MSISDN number, the mobile subscriber need not inconveniently notify his friends and associates of his new MSISDN number.

Number portability also allows more efficient usage and better management of the network resources. If a PLMN comprises a number of HLRs, and the workload or capacity is unevenly distributed across the network, it would be advantageous to transfer some of the subscription agreements or subscriber information from one of the HLRs with overloaded capacity to another HLR with lesser load without changing the MSISDN numbers assigned to the associated mobile stations. By reallocating some of the subscriber information and evenly distributing the workload, the PLMN is better able to manage its resources and workload.

As described previously, the GMSC properly routes an incoming call to the serving MSC 40a because the dialed MSISDN number includes a value indicative of which HLR within the home PLMN 10 is storing the requisite subscriber information. Consequently, the GMSC 80 analyzes the received MSISDN number, determines the appropriate HLR 90, requests routing instructions from the determined HLR 90, and then routes the incoming call to the appropriate MSC.

As illustrated by the relocation 35, the mobile station 30 terminates his subscription agreement with the existing PLMN 10a and registers with the new PLMN 10b. However, because the assigned MSISDN number has not been updated in the mobile station to reflect the new PLMN 10b and the HLR 90b, all future incoming calls are still routed to the old PLMN 10a. The GMSC within the PLMN 10a is not able to reroute the received incoming calls to the relocated mobile station 30 because the GMSC 80a is not able to determine the correct HLR 90b storing the subscriber information by merely analyzing the received MSISDN number.

Reference is now made to FIG. 2 illustrating the routing of a terminating call to the ported mobile station 30. In accordance with the concept of number portability, a new centralized database is associated with the serving telecommunications network. When a particular mobile station is ported from a first PLMN 10a to a second PLMN 10b, the centralized database, also known as a number portability database (NP-DB) 140, stores a record 145 correlating the MSISDN number assigned to the ported mobile station with the new PLMN 10b, or more particularly the new HLR 90b, serving the ported mobile station 30. Accordingly, an operator 130 associated with the NP-DB 140 updates the record 145 to reflect the new PLMN 10b to which the mobile station has been ported.

Thereinafter, when a telecommunications terminal 15 requests a call connection with the ported mobile station 30 by dialing the MSISDN number assigned to the mobile station 30, and an application module 130 within the originating telecommunications node 70 serving the calling party terminal 15 queries the NP-DB 140 associated with the dialed MSISDN number. Using database query 160, the originating telecommunications node, such as a local exchange (LE) within a PSTN or a mobile switching center (MSC) within a PSTN, identifies the new PLMN 10b and the HLR 90b currently serving the ported mobile station 30 and

originates an outgoing call connection 170 directly towards the new PLMN 10b. The network address representing the new PLMN 10b, or more particularly the GMSC 80b, is included in the outgoing call setup signal, such as an Initial Address Message (IAM), as the called party number (CdPn). The originally dialed MSISDN number representing the ported mobile station is further included into one of the parameters within the call setup signal. Within an IAM signal, such an optimal parameter may include a Generic Address Parameter (GAP). Using the GAP, the MSISDN number is "piggy-back" to the new PLMN 10b. Since the specified network address points to the new PLMN 10b, the IAM signal is routed to the GMSC 80b serving the PLMN 10b. The PLMN 10b then determines which HLR is associated with the ported mobile station 30 by further analyzing the received network address and transmits a signal 100 requesting a routing instruction to the determined HLR 90b. The signal 100 further includes the MSISDN number included in the received IAM signal. The HLR, in turn, extracts the included MSISDN number, determines the MSC 40b currently serving the ported mobile station 30, and transmits a signal 110 to the determined MSC 40b for a roaming number. As a result, the roaming number is returned to the HLR and, subsequently, to the GMSC 80b. Utilizing the received roaming number as the new called party number (CdPn), the received incoming call is rerouted by the GMSC 80b to the MSC 40b currently serving the mobile station 30. Accordingly, a rerouted call connection 120 is established between the GMSC 80b and the serving MSC 40b. The serving MSC 40b then pages the mobile station 30 and establishes a speech connection over a radio channel.

As a result, even though the assigned MSISDN number still reflects the first PLMN 10a as the home PLMN, upon querying the NP-DB 140 by the originating telecommunications node, a call connection is properly

routed to the second PLMN 10b currently associated with the mobile station 30 as the new home PLMN.

Even with the NP-DB 140 for routing terminating calls to a ported mobile station, the efficiency and wastefulness of call "tromboning" still exists for a call connection to a roaming mobile station. Reference is now made to FIG. 3 illustrating the tromboning of trunk connections to establish call connections between a calling party terminal and a roaming called party mobile station. When a calling party terminal 15 requests a call connection with the mobile station 30, the application module 130 within the originating telecommunications node 70 queries the NP-DB 140 to determine the home PLMN 10 associated with the called party mobile station 30 (signal 160). As previously described above, the calling party terminal 15 may be a wireline terminal being served by a wireline local exchange or may be a calling party mobile station being served by a mobile switching center (MSC).

Regardless of whether the called party number has been ported, a network address representing the home PLMN, or more particularly the serving GMSC 80, is returned to the querying telecommunications node 70. If the called party mobile station 30 has been ported, the returned network address represents the new home PLMN 10b. If not, the returned network address represents the original or old home PLMN 10a.

If the calling party terminal is located within first Local Access Transport Area (LATA or more commonly known as an area code) 300 and the called party mobile station is associated with a PLMN within a second LATA 310 but currently roaming within the first LATA 300, inefficient and wasteful call connections are established. As an illustration, the mobile station 30 is associated with the N.Y. LATA or PLMN 310, and currently roaming within the L.A. LATA or PLMN 300. If another telecommunications terminal 15 located within the L.A. LATA or PLMN requests a call connection to the roaming mobile station 30, a

first call connection 170 (as illustrated by the solid line), such as a trunk connection, is established between the L.A. telecommunications node 70 and the N.Y. GMSC 80 serving the home PLMN. The N.Y. GMSC 80 interrogates the HLR 90 associated with the called party mobile station 30 by transmitting a signal 180 requesting a routing instruction to the determined HLR 90. The HLR keeps track of the MSC 40 currently serving the mobile station 30 because whenever the mobile station 30 travels into a new MSC coverage area, the MSC providing mobile service for that particular geographic area performs a location update with the HLR 90 associated with the mobile station. The transmitted location update signal informs the HLR 90 of the current location of the traveling mobile station and requests requisite subscriber information from the HLR 90. Accordingly, the HLR 90 determines that the L.A. MSC 40 is currently serving the roaming mobile station 30 and, in turn, transmits a signal 190 requesting a roaming number to the serving L.A. MSC 40. The L.A. MSC 40 returns a signal 190 including the requested roaming number representing the serving MSC 40 to the HLR 90. The HLR 90 then returns the received roaming number to the GMSC 80. Since the received roaming number represents the L.A. MSC 40, a second call connection 220 between the N.Y. GMSC 80 back to the L.A. MSC 40 is established. As a result, in order to establish a call connection between two locally located terminals, wasteful and inefficient call connections via the N.Y. GMSC 80 are established.

FIGURE 4 is a block diagram illustrating the home location register (HLR) 90 associated with the roaming mobile station 30 updating a number portability database (NP-DB) 140 in accordance with the teachings of the present invention. Whenever the mobile station 40 travels into a new MSC coverage area, the MSC 40 providing mobile service for that particular geographic area performs a location update with the HLR 90 associated with the mobile station 30. The mobile station 30 initially transmits an

identification number, such as an International Mobile Subscriber Identity (IMSI) number to the serving MSC 40. By utilizing the received IMSI number as the destination address, the serving MSC 40 transmits a location update signal 250. Since, a series of IMSI numbers are typically assigned to an HLR, by analyzing the specified IMSI number, the connected telecommunications network, such as a Signaling System No. 7 (SS7) telecommunications network can route the transmitted location update signal 250 to the HLR 90 associated with the mobile station 30. The location update signal 250 also includes a network address representing the serving MSC 40 to inform the HLR 90 of the current location of the mobile station 30 and requests requisite subscriber information from the HLR 90. Such subscriber information includes application feature data, billing data, and the MSISDN number associated with the mobile station 30. Upon receiving the location update signal 250 from the newly serving MSC 40, a return signal 260 with the requisite subscriber information is communicated to the serving MSC 40. An application module 240 within the HLR 90 then analyzes the received network address to determine whether the newly serving MSC 40 is located outside of the home PLMN. As an illustration, if the mobile station 30 is associated with the N.Y. PLMN 310 and the newly serving MSC 40 is associated with the L.A. PLMN 300, the application module 240 determines that the mobile station 30 is roaming outside of the home PLMN 310 and further determines that it would be more economical and efficient to perform optimized routing of incoming calls to the roaming mobile station 30. As a result, the application module 240 transmits a connection-less signal 270, such as a Signal Control Connection Part (SCCP) based signal, to the NP-DB 140 serving the home PLMN. The transmitted connection-less signal 270 includes the network address representing the L.A. MSC 40 currently serving the mobile station 30. The register 145 within the NP-DB 140 is updated with the network address

representing the L.A. MSC 40, and indirectly the L.A. PLMN 300, as the new home PLMN for the mobile station 30. Accordingly, as far as the NP-DB 140 is concerned, the mobile station 30 has been ported from the N.Y. PLMN 310 to the L.A. PLMN 300 as if the mobile station 30 terminated its subscription agreement with the N.Y. PLMN 310 and established a new subscription agreement with the L.A. PLMN 300. After the successful completion of the "porting", a return signal 280 with a successful return code is transmitted to the HLR 90.

Reference is now made to FIG. 5 illustrating an originating telecommunications node 70 optimally routing an outgoing call connection to the roaming mobile station 40b. As described above in FIG. 4, when the mobile station 30 associated with the N.Y. PLMN 310 is roaming within the L.A. PLMN 300, the NP-DB 140 has been updated with the network address representing the L.A. MSC 40b currently serving the roaming mobile station 30 by the N.Y. HLR 90. Thereinafter, when any telecommunications terminal, such as the L.A. calling party terminal 15 associated with the L.A. originating telecommunications node 70 requests a call connection to the roaming mobile station 30, the application module 130 within the originating telecommunications node 70 queries the NP-DB 140 associated with the dialed directory number in a conventional manner (signal 160). In return, the NP-DB 140 returns the network address updated by the HLR 90 and representing the L.A. MSC 40b currently serving the mobile station 30 to the requesting originating telecommunications node 70 (signal 165). Utilizing the received network address as the new destination address, a call setup signal, such as an IAM signal, is transmitted directly to the serving MSC 40b. The directory number associated with the roaming mobile station 30 is further included in one of the parameters within the transmitted call setup signal. Such parameters may include a Generic Address Parameter (GA) within the IAM signal. Since the

specified network address is a wireline number representing the serving L.A. MSC 40b, the call setup signal is directly routed to the specified MSC 40b instead of to the L.A. GMSC (not shown) associated with the serving L.A. MSC 40b. Accordingly, no HLR interrogation needs to be performed.

As a result, a call connection 270 is established between the originating telecommunications node 70 and the serving MSC 40b. The serving MSC 40b then extracts the included MSISDN number representing the mobile station 30 from the received IAM signal and identifies the appropriate mobile station currently roaming within its coverage area. After the identification, the serving L.A. MSC 40b pages the mobile station 30, and establishes a call connection between the calling party terminal 15 and the roaming mobile station 30. Optimized routing of a call connection between two locally located calling party terminal and called party mobile station is thus established.

Whenever the mobile station 30 travels back into the home PLMN, e.g., N.Y. PLMN 310, an MSC 40a associated with the home PLMN transmits another location update signal 250 to the HLR 90 to inform the HLR 90 of the new location of the mobile station 30. Since the IMSI number associated with and transmitted by the mobile station is still associated with the N.Y. PLMN 310, the location update signal is properly routed to the N.Y. HLR 90. The HLR 90, in turn, transmits the necessary subscriber information to the newly serving MSC 40a (signal 270). The application module 240 within the HLR 90 then determines that the newly serving MSC 40a is located within the home PLMN 310. As a result, the application module 240 transmits another signal 320 to the NP-DB 140 to remove the previously stored data from the register 145 indicating that the mobile station 30 has been ported and to replace the centralized database with a network address representing the home PLMN 310 or more particularly the

home GMSC. A return signal 330 informing the HLR 90 of the successful updating is further transmitted from the NP-DB 140 to the HLR 90. Thereinafter, whenever any originating telecommunications node queries the NP-DB for routing instructions, the network address representing the GMSC (not shown in FIG. 5) serving the N.Y. PLMN 310 is returned. Accordingly, incoming calls are routed to the GMSC serving the N.Y. PLMN 310 and eventually to the N.Y. MSC 40a currently serving the mobile station 30.

In case the newly serving MSC 40a is also located outside of the home PLMN 310, the centralized database is further updated with the network address representing the newly serving MSC 40a. In a manner similar to as described above, optimized call routing to the newly serving MSC 40a is accordingly performed.

Although a preferred embodiment of the method and apparatus of the present invention has been illustrated in the accompanying Drawings and described in the foregoing Detailed Description, it will be understood that the invention is not limited to the embodiment disclosed, but is capable of numerous rearrangements, modifications and substitutions without departing from the spirit of the invention as set forth and defined by the following claims.

WHAT IS CLAIMED IS:

1. A method for keeping track of a current location of a mobile station within a mobile telecommunications network, said method comprising the steps of:

receiving a first signal at a home location register (HLR) associated with said mobile station, said first signal indicating the identity of a first telecommunications node currently serving said mobile station;

determining by said HLR that said first telecommunications node is located outside of a home public land mobile network (PLMN) associated with said mobile station; and

in response to said determination, updating a centralized database associated with said home PLMN from said HLR to store data indicating that said first telecommunications node is currently serving said mobile station.

2. The method of claim 1 further comprising the steps of:

receiving a second signal at said HLR indicating the identity of a second telecommunications node currently serving said mobile station;

determining by said HLR that said second telecommunications node is located within said home PLMN; and

in response to said determination, updating said centralized database to remove said data indicating that said first telecommunications node is currently serving said mobile station.

3. The method of claim 1 wherein said first telecommunications node comprises a mobile switching center (MSC) currently serving said mobile station.

4. The method of claim 1 wherein said first signal comprises a Mobile Application Part (MAP) based location update signal.

5. The method of claim 1 wherein said centralized database comprises a number portability database (NP-DB).

6. The method of claim 1 wherein said step of updating said centralized database further comprises the step of transmitting a Signaling Control Connection Part (SCCP) based connection-less signal from said HLR to said centralized database, said SCCP based signal including a network address representing said first telecommunications node.

7. The method of claim 1 wherein said first signal further includes a network address representing said first telecommunications node.

8. A method for storing data identifying a mobile telecommunications node currently serving a particular mobile station, said method comprising the steps of:

receiving an indication at a home mobile telecommunications network associated with said particular mobile station, said indication indicating that said mobile telecommunications node is currently serving said mobile station;

determining that said mobile telecommunications node is not associated with said home mobile telecommunications network; and

updating a centralized database associated with said home mobile telecommunications network with data indicating that said mobile station is currently being served by said mobile telecommunications node.

9. The method of claim 8 wherein said step of receiving said indication is performed by a home location register (HLR) associated with said mobile station.

10. The method of claim 9 wherein said step of updating said centralized database is performed by said HLR.

11. The method of claim 10 wherein said step of updating said centralized database further comprises the step of said HLR transmitting a connection-less signal with said data over a connected Signaling System No. 7 (SS7) telecommunications network.

12. The method of claim 8 wherein said home mobile telecommunications network comprises a home public land mobile network (PLMN) associated with said mobile station.

13. The method of claim 8 wherein said indication comprises a location update signal transmitted by said mobile telecommunications node.

14. The method of claim 13 wherein said location update signal includes a network address representing said mobile telecommunications node.

15. The method of claim 8 wherein said mobile telecommunications node comprises a mobile switching center (MSC) serving said mobile station.

16. A system for storing data identifying a mobile telecommunications node currently serving a particular mobile station at a centralized database, said mobile station and said centralized database associated with a home mobile telecommunications network, comprising:

means for receiving an indicating at said home mobile telecommunications network associated with said particular mobile station, said indication indicating that said mobile telecommunications node is currently serving said mobile station;

means for determining that said mobile telecommunications node is not associated with said home mobile telecommunications network; and

means, in response to said determination, for updating said centralized database associated with said home mobile telecommunications network with data indicating that said mobile station is currently being served by said mobile telecommunications node.

17. The system of claim 16 wherein said means for receiving said indication comprises a home location register (HLR) associated with said mobile station.

18. The system of claim 17 wherein said means for updating said centralized database comprises said HLR.

19. The system of claim 18 wherein said means for updating said centralized database further comprises means for transmitting a connection-less signal with said data over a connected Signaling System No. 7 (SS7) telecommunications network to said centralized database.

20. The system of claim 16 wherein said home mobile telecommunications network comprises a home public land mobile network (PLMN) associated with said mobile station.

21. The system of claim 16 wherein said indication comprises a location update signal transmitted by said mobile telecommunications node.

22. The system of claim 21 wherein said location update signal includes a network address representing said mobile telecommunications node.

23. The system of claim 16 wherein said mobile telecommunications node comprises a mobile switching center (MSC) serving said mobile station.

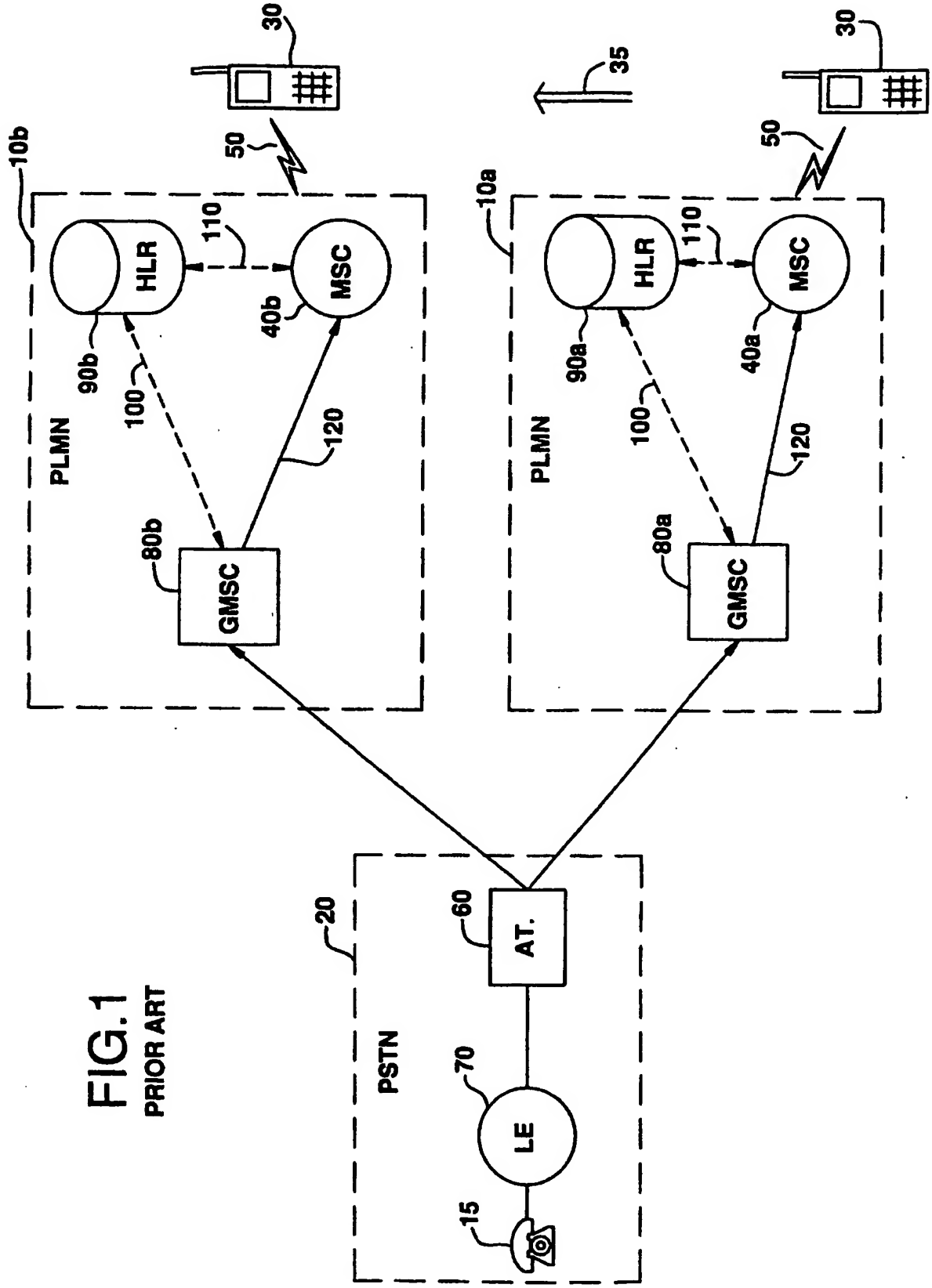


FIG.1
PRIOR ART

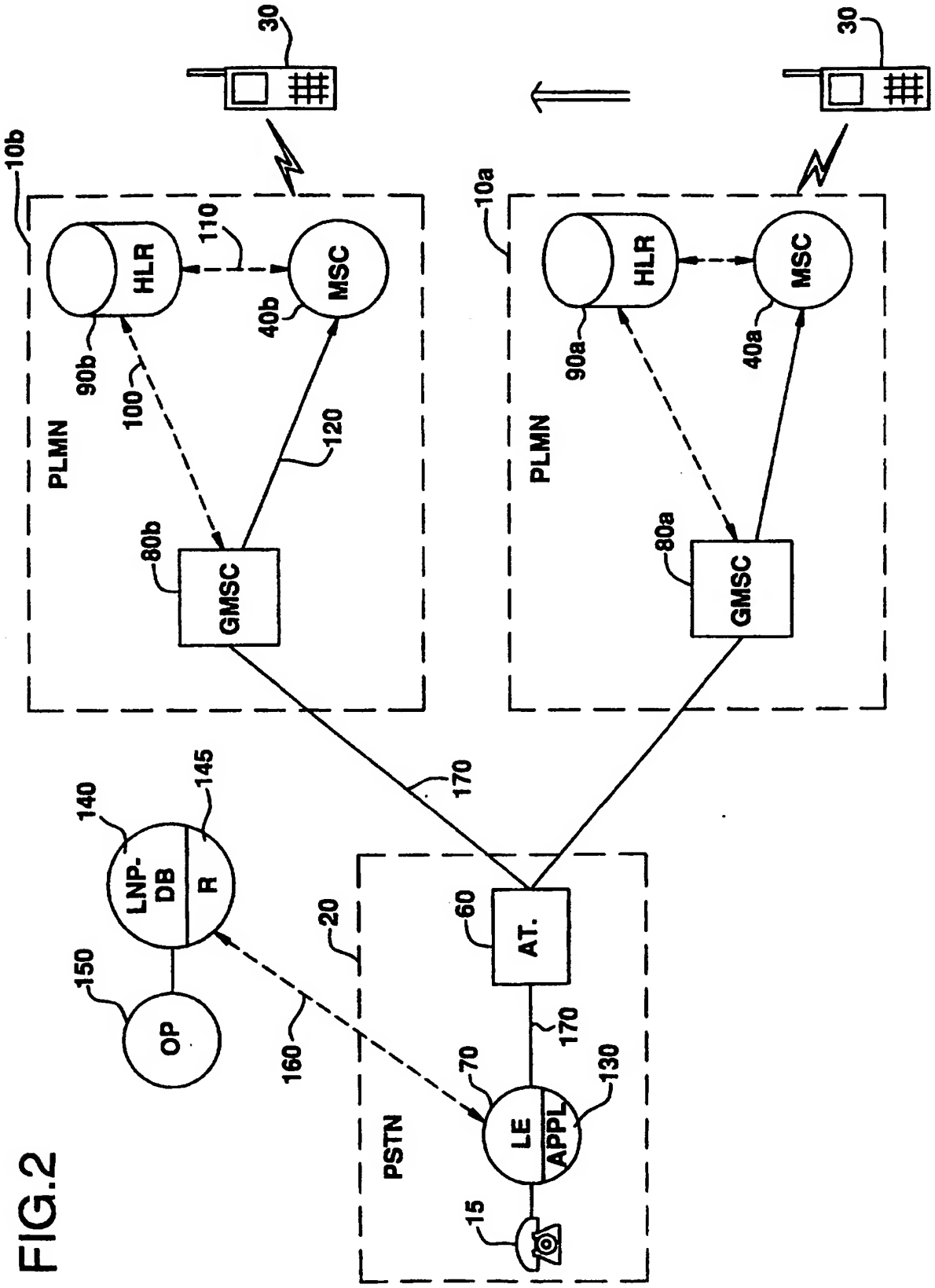

30
30
10b
10a
HLR
MSC
110
40b
90b
100
120
PLMN
80b
GMSC
HLR
MSC
90a
40a
PLMN
80a
GMSC
170
140
145
LNP-DB
R
150
OP
160
20
60
AT.
170
70
130
LE
APPL
PSTN
15

FIG.2

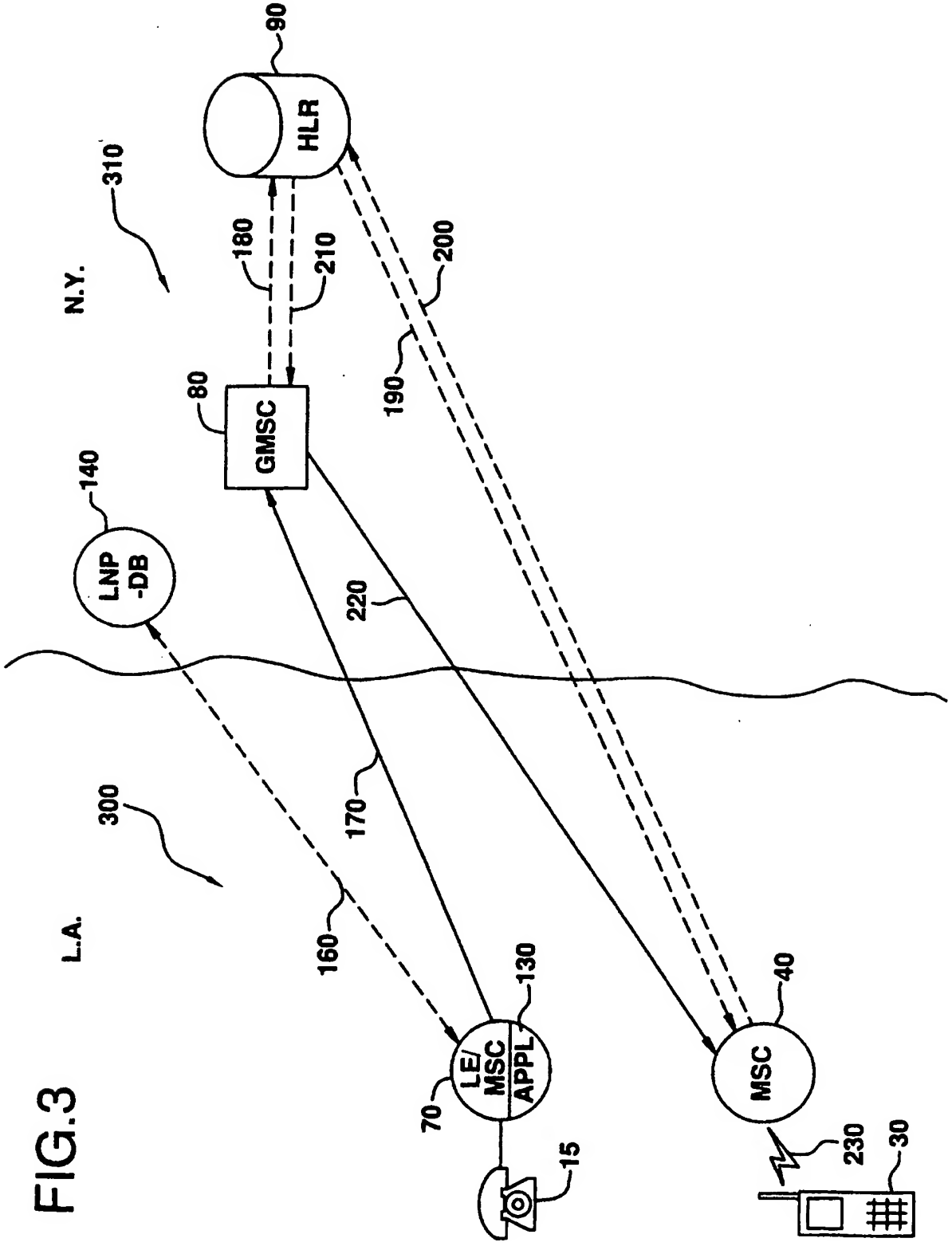
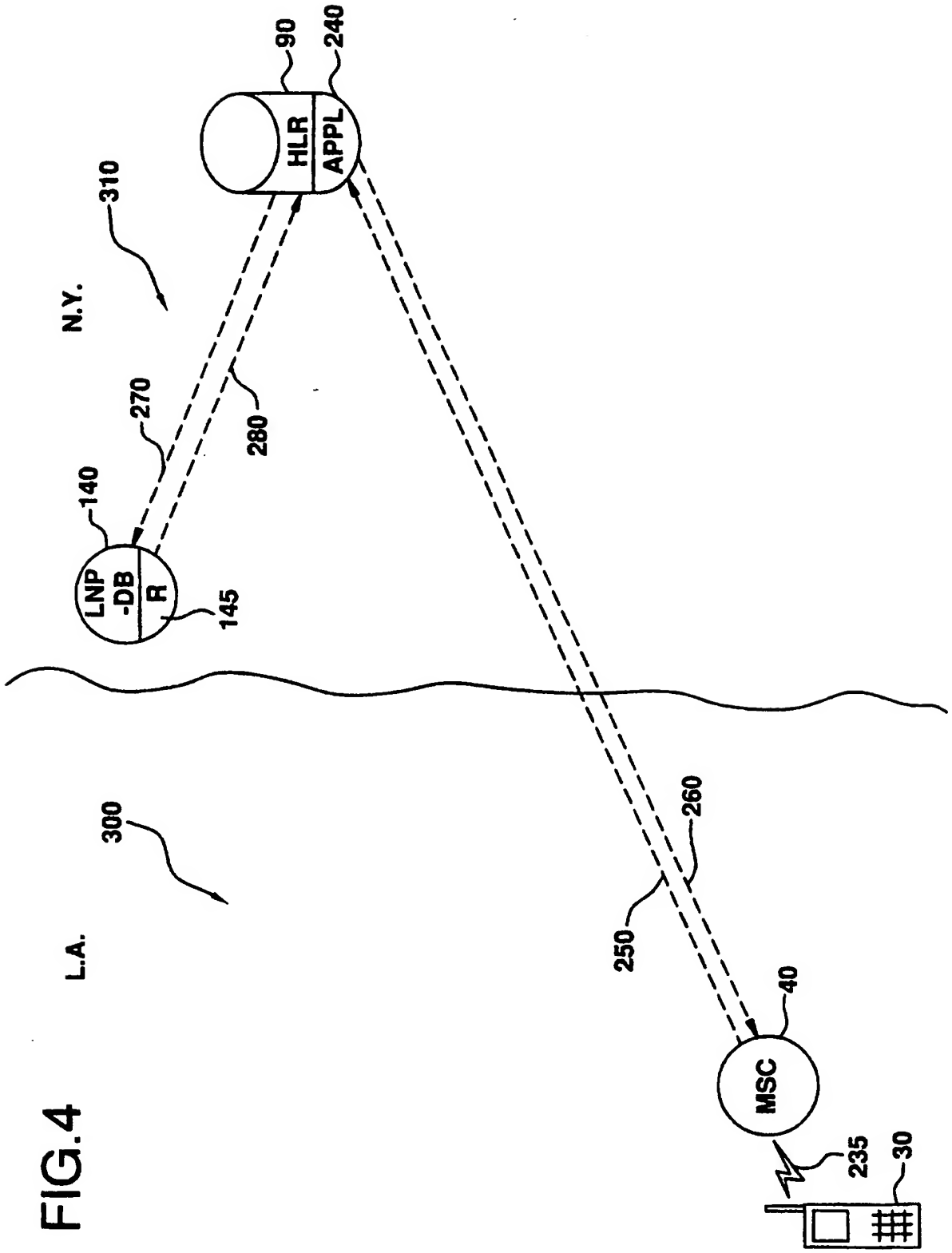

90
HLR
310
N.Y.
180
210
200
190
80
GMSC
140
LNP
-DB
220
300
L.A.
170
160
130
LE/
MSC
APPL
70
15
40
MSC
230
30

FIG.3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240
HLR
APPL
310
N.Y.
270
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LNP
-DB
R
145
300
L.A.
260
250
40
MSC
235
30

FIG.4

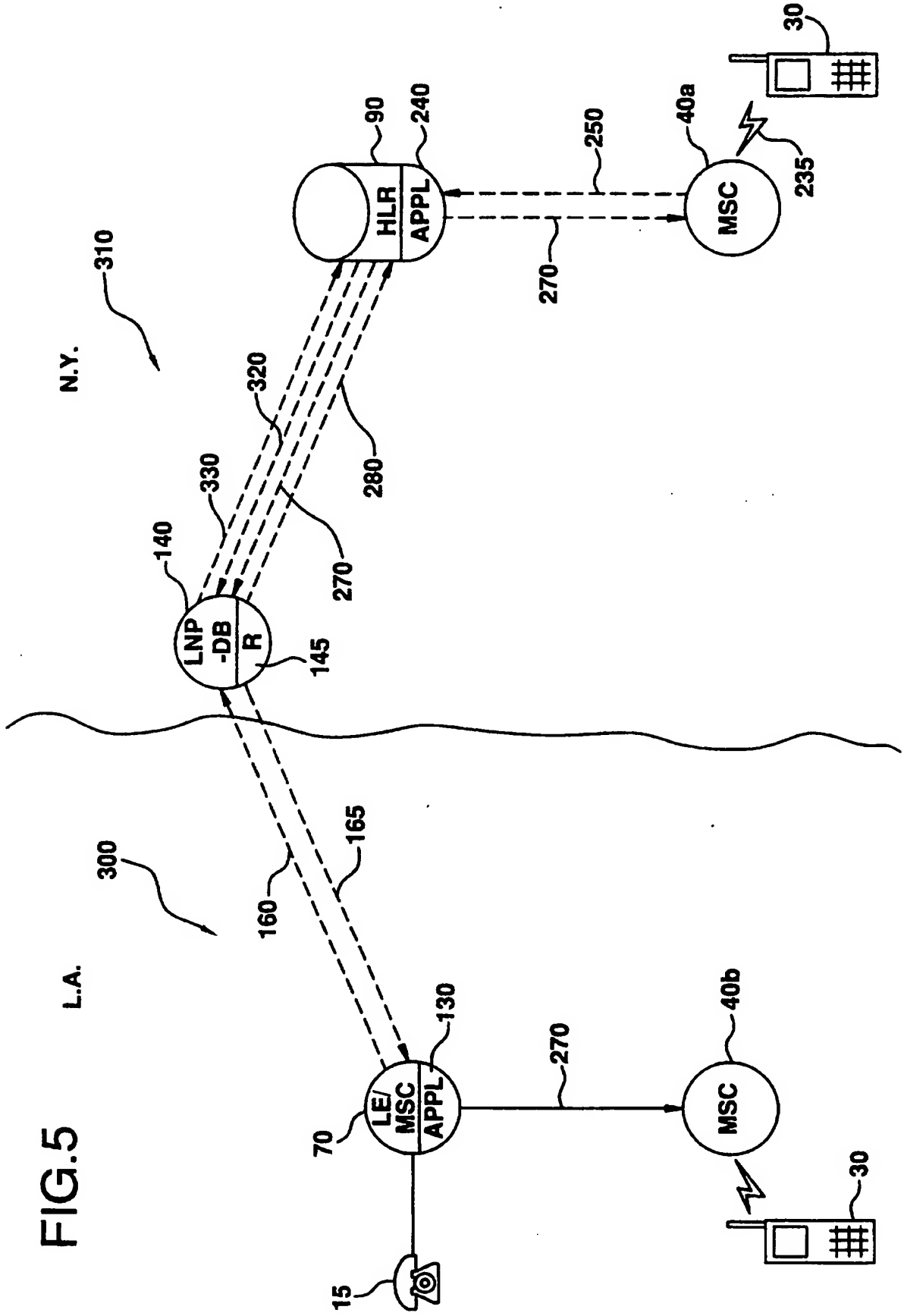
30
90
240
250
40a
235
HLR
APPL
MSC
310
N.Y.
320
330
280
270
140
LNP
-DB
R
145
270
165
160
300
L.A.
130
40b
LE/
MSC
APPL
270
70
MSC
30
15

FIG.5

INTERNATIONAL SEARCH REPORT

International application No
PCT/[redacted]/16479

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q7/38 H04Q7/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 288 302 A (TELIA AB) 11 October 1995 see page 6, line 3 - page 15, line 17	1,3,4, 6-10, 12-14, 16-18, 20-22
A	EP 0 512 962 A (ERICSSON TELEFON AB L M) 11 November 1992 see column 5, line 13 - column 13, line 29 -/--	1-3,7-9, 12, 15-17, 20,23

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
24 February 1998	03/03/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Maalismaa, J

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INTERNATIONAL SEARCH REPORT

[redacted]

Internatio[redacted]pplication No
PCT/U[redacted]16479

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GIORDANO A ET AL: "PCS NUMBER PORTABILITY" IEEE INTERNATIONAL SYMPOSIUM ON PERSONAL, INDOOR AND MOBILE RADIO COMMUNICATIONS, 18 September 1994, pages 1146-1150, XP002037912 see page 1146, right-hand column, line 17 - page 1148, left-hand column, line 25 -----	

INTERNATIONAL SEARCH REPORT

[redacted]ation on patent family members

International application No
PCT[redacted]/16479

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		DE 69221371 T	11-12-97
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